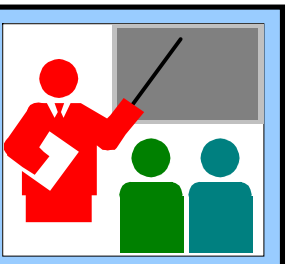
Technician manual lambda control



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- **Active combustion air regulation with O_2 sensor**
- **Modulating operating**
- **Integrated return high posture**
- **Integrated buffer charge regulation**
- **Certificated by the guidelines of the EU**
- **Multifunctional system application**

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Short description of the controller “lambda control”

- Active combustion air regulation for the optimization of the emissions values with different fuel qualities and different moisture
- Sensors: Boiler-, exhaust- and buffer- or return sensor / O_2 sensor
- Integrated return high posture and buffer charge regulation
- Integrated operating continuation by combination with oil-/gas boiler
- Automatic speed change-over, depending on the boiler output-related power by 2-step exhaust fan
- Modulating operation by motor regulated primary- and secondary air
- Assistance of the chimney-sweep by own test function: Nominal power or partial load for emission test and security test for the checking of the STB and the thermal expiry protection
- Protective functions for boiler and aggregates at close-down (summer)
- Function protection against frost if the boiler temperature is less than 5°C
- An easy service with text display
- Refueling signal at the controller and as a remote indication possibly
- Service program for introduction and servicing
- Automatically activated alternative programs by any faults
- Fault indication in plaintext
- Text display into several languages
- Storage space for specific characteristics of the different boiler types
- Programmable for different system applications
- Made and checked by the guidelines of the EU

SYSTEM 1: Monovalent system with or without process water tank

- Regulation of the process water temperature by lambda control
- Heating regulation: By hand or automatically with minimum heat consumption
- Heating release (heating pumps) by lambda control
- Winter or summer function selectable by the customer

SYSTEM 2: Bivalent system with or without process water tank

- Regulation of the process water temperature by lambda control or by regulation of the oil-/gas boiler
- Heating regulation by oil-/gas boiler with minimum heat consumption
- Compulsive warmth decrease before the boiler is switching to readiness
- Automatic operating continuation at alternative operating method

SYSTEM 3 and 4: Mono- or bivalent system with buffer and loading valve

- Dimensioning of the boiler output according to warm need calculation
- Heating precedence (starting-up discharge by switching off the buffer)
- Intelligent buffer management after a ***Logotherm*** **PATENT** (buffer charge priority depending on boiler temperature set value)
- Rest warmth denial to boiler minimum temperature (difference regulation)
- Refueling signal at under-usage of the buffer minimum temperature

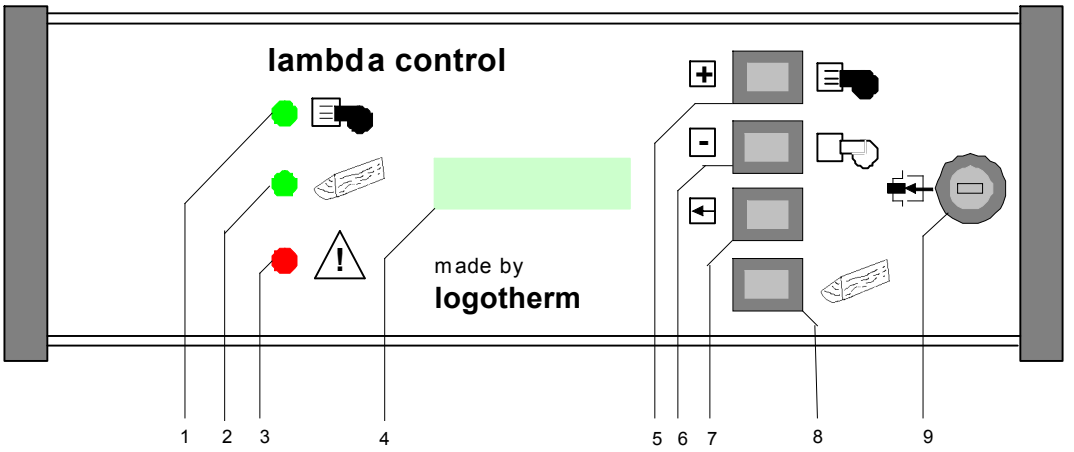
SYSTEM 5: Mono- or bivalent system with buffer (loading valve optional)

- Steady temperature load by regulated return temperature of the wood boiler
- Regulation of the return temperature of an oil-/gas boiler by bivalent systems with automatic operating continuation
- All buffer connection variations
- Rest warmth denial to boiler minimum temperature
- Refueling signal after burn-out of the boiler (automatic operating continuation)

Additional function with loading valve

- Dimensioning of the boiler output according to warm need calculation
- Heating precedence (starting-up discharge by switching off the buffer)
- Intelligent buffer management after a ***Logotherm*** **PATENT** (buffer charge priority depending on boiler temperature set value)

Display- and control elements



1 Display “Heat generation ON”
2 Display “Refuelling”
3 Display “Fault”
4 Text display

5 Button “Heat generation ON / +”
6 Button “Heat generation OFF / -”
7 Button “ ◄┘”
8 Button “Refuelling”
9 Reset button of the safety temperature limiter (STB)

Display “Heat generation ON”

- Shines, if the combustion expiry is start-up by
  - pushing the button “Heat generation ON”, or automatically
  - if the exhaust temperature is enough.

- Goes out, if the combustion expiry is stopped by
  - pushing the button “Heat generation OFF”, or automatically
  - if the fuel material is used up.

Display “Refueling”

- Shines, if
  - the heat generation was switched off and
  - the warm need of the system renewed refueling required or allowed.
- Flashes, during the function “Refueling”.
- Goes out if the warm production is switched on.

Display “Fault”

- Shines if faults appear which do not allow a continuation of the warm production, or the turning on of the warm production.
- Flashes if faults appear which allow a continuation of the warm production, or the turning on of the warm production. (Control after alternative program up to disturbance removal)
- Goes out if the faults were repaired and were reset.

Text display

- Switched ON ,
  - in the operation state “Heat generation ON” or
  - in the operation state “Heat generation OFF” by pushing a button.
- Switched OFF,
  - in the operation state “Heat generation OFF” and after the expiration of 15 minutes.

Display- and control elements

Button "Heat generation ON / +"

- Function level 1: By pressure of the button, warm production becomes the operation state ON.
- Function level 2: By pressure of the button
  - functions can be selected or
  - settings can be changed.

Button "Heat generation OFF / −"

- Function level 1: By pressure of the button,
  - warm production becomes the operation state OFF or
  - the function "Refueling" will be prematurely cancelled.

- Function level 2: By pressure of the button,
  - functions can be selected or
  - settings can be changed.

Button " ◄— "

- By pressure of the button occurs
  - the entrance in the choice menu and
  - the switchover to the function level 2.

- By renewed pressure of the button occurs the confirmation of
  - the selected functions or
  - the changed settings.

Button "Refueling"

- By pressure of the button occurs
  - the start-up of the exhaust fan in the high speed and
  - after 15 sec. the enabling of the electromagnetic door opener for 10 sec. (After the expiration of 10 minutes the automatic cancelling of the function "Refueling" occurs)

Reset button of the safety temperature limiter (STB)

If the STB has released as a result of a too high boiler temperature, and has dropped afterwards the boiler temperature on approx. 80°C, is

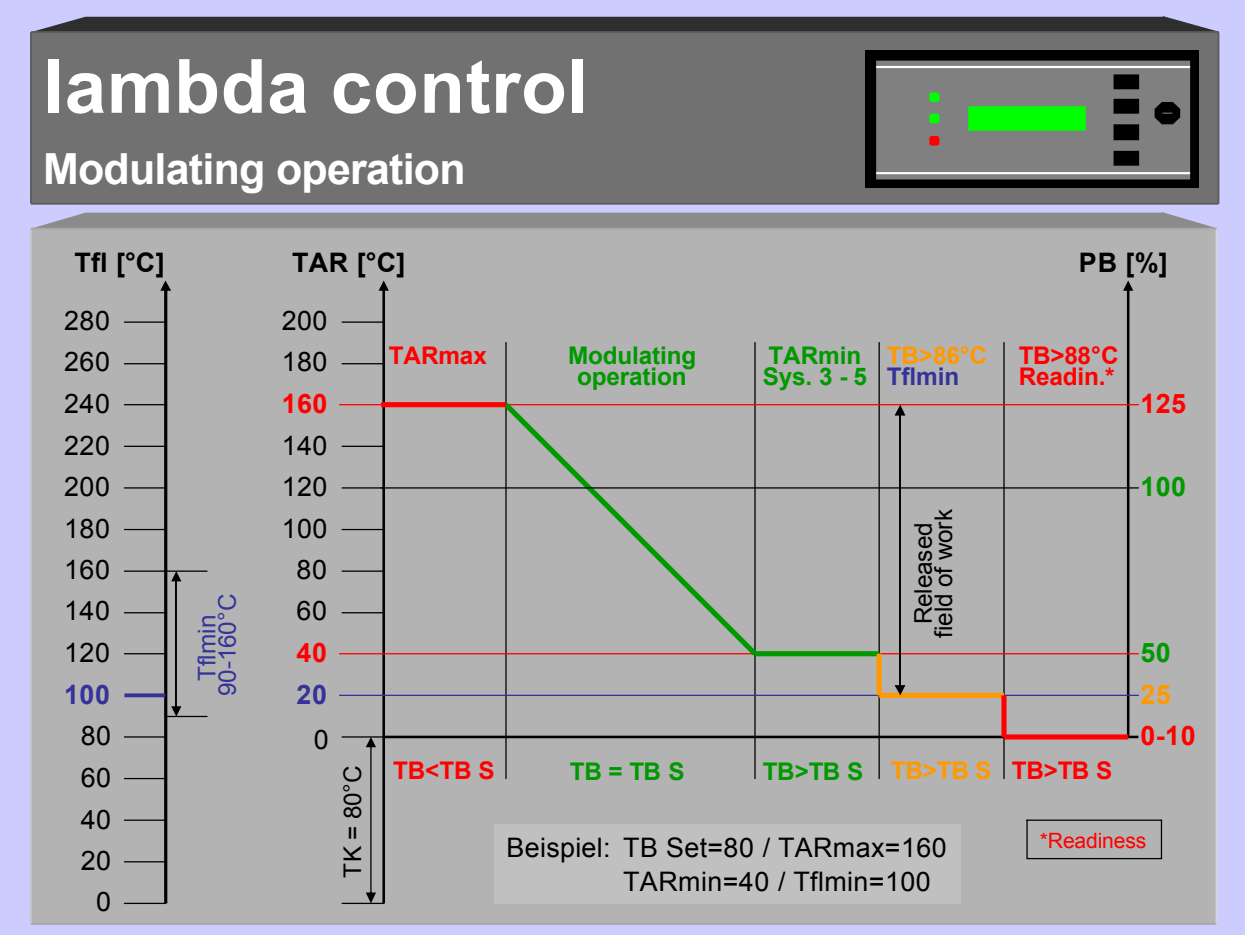
- by pressure of the button
  - the STB reset and
  - the fault is automatically receipted.

Output regulation

The divergence of the boiler temperature-actual value **TB act.** and the boiler temperature-set value **TB set** becomes, taking into account the minimum and maximum exhaust temperature, moved in a combustion air amount (motor steered air flaps in 200 steps).
The controller automatically selects, according to power requirement, the necessary fan step.

TB act. < TB set minus 2°C = speed level 2	TB act. > TB set plus 2°C = speed level 1

If the boiler temperature **TB act.** is smaller than the boiler temperature set value **TB S**. the power can be raised up to at most allowed exhaust temperature **Tfl**.
If **TB I** rises about **TB S**, the boiler power can be reduced up to minimally allowed **Tfl**.
The minimum exhaust temperature is that, for the chimney needed, least exhaust temperature **Tflmin**.
With system 3 to 5 the controller follows, in addition, the exhaust temperature for checked partial load **TARmin**.
If the exhaust temperature is bigger for partial load than **Tflmin**, this is kept up to a boiler temperature from 86°C. If the boiler temperature is > 86°C, it is also regulated with system 3 to 5 on **Tflmin**.
This allows in the released exhaust temperature area the boiler temperature and with it the power consistently to hold.
If a boiler temperature from **88°C** is reached (achievement decrease below the necessary exhaust temperature) the controller switches off the fan (Readiness). The primary air flap is put on least opening, the O_2 regulation works after standard program.
If the boiler temperature rises on **90°C**, both flaps are closed.
If the boiler temperature sinks on **87.5°C**, the exhaust fan is switched on and the **secondary air flap open for one minute to ventilate the chimney**.



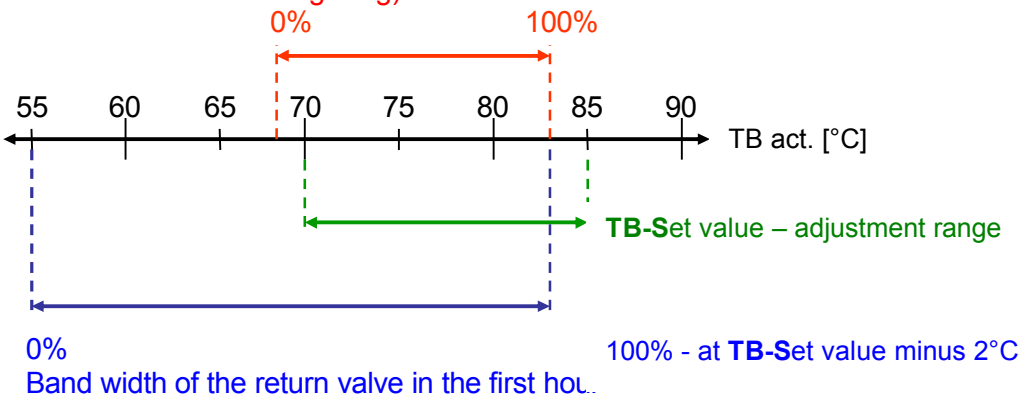
Return valve regulation system 1 to 4

1. Return valve regulation system 1 to 4

Task of the return valve: Return high posture (Boiler protection function).
A high quantity of water is made available very quickly by the **automatic band width regulation of the return valve** for the system heating.
To receive this function with system 3 and 4, a loading valve **must be** used (heating starting-up discharge by disconnection of the buffer).

Example with TB-Set value 85°C

Band width of the return valve after the first hour (the reduction of the band width occurs gliding)



Advantages of the engine-steered return valve

- Return high posture - Boiler protection
- Prevention of the clocking of the heat extraction with cold heating system
- Prevention of the gravitation circulation after burn-out with loaded buffer
- Rest warmth use also at boiler temperatures <60°C

Loading valve regulation system 3 and 4

2. Loading valve regulation System 3 and 4
Effect of the TB-set setting to the boiler- and loading output

Example 1: TB-set setting 70°C causes a buffer load with boiler partial load and only with the difference boiler partial load minus warm need
Operating range:

- Small Buffer volume (Load balance memory)
- Low temperature heating
- Solar-integration into the buffer

The boiler temperature is regulated on **70°C,** at exhaust temperature area **TARmax** = maximal output and **TARmin** = Partial load, (modulating operation). If less output is required than with TARmin (partial load) is generated, the boiler temperature rises over **70°C**.
From 72°C the loading valve is opened proportionally to the boiler temperature and the overrun output (partial load minus warm need) is stored in the buffer.

Example 2: TB set setting 80°C causes a buffer load after starting-up discharge with raised loading output
Operating range:

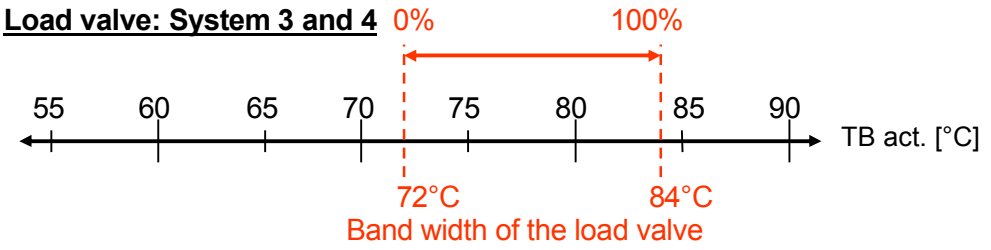
- Buffer volumes enough for the admission of a complete fuel charge
- Thermal buffering is volitional (loaded buffer)

By the TB-set setting **80°C** the regulator has the ambition to reach this temperature.
If the boiler temperature is less than **80°C** the regulator raises the output to **TARmax**.
While crossing from 72°C (starting-up discharge finished) the loading valve opens proportionally to the boiler temperature and loads the boiler by which this works furthermore on higher output.
The actual boiler output and boiler temperature is depending on warm need of the heating and the temperature of the buffer.
If the boiler temperature rises above **TB-set**, the boiler is steered on partial load, the loading valve is further opened and the buffer is further loaded.
By reduced boiler output the difference is reduced (boiler flow to return) and the buffer can be still raised **2 times about per 4°C**, without the regulator switches in readiness (88°C = readiness). **Boiler set values ≤80°C results lowest standby time.**

By the loading valve function you have the following vantages;

Heating starting-up discharge	**closed by loading valve under 72°C** (Boiler output must not become oversized)
Automatic adaptation of the loading output with rest warmth in the buffer	**by loading valve - band width regulation**
Free selectable supercharging rate respectively loading capacity	**by TB-set setting and output regulation to TB-set value**

Loading valve position in dependence of the boiler temperature-actual value
TB act. <= 72°C Loading valve 0% = Return buffer upside
TB act. = 78°C Loading valve 50% = Return buffer at the bottom opened with 50%
TB act. >= 84°C Loading valve 100% = Return buffer at the bottom opened with 100%



Return- and loading valve regulation system 5

Constant boiler flow temperature by constant return temperature

A constant boiler flow temperature is due to the constant return temperature.
The return valve is regulated regardless of the return temperature **TR** by the buffer system and heating system on the return set value **TR S**. The delivered quantity of water to the buffer system and heating system is calculated after the formula: **Litre = 860 x kW / Difference**. In this case the difference is measured between the **boiler flow and the return from the buffer system and heating system**.
Remark: The heating flow temperature can be smaller than the boiler flow temperature if the delivered **boiler amount of water is smaller than the heating flow amount**.
For example: Buffer cold / Heat consumption greater than boiler output.

1. Gliding return set value by boiler temperature set value minus difference

The difference is measured between the **boiler flow and the boiler return**.
It follows from the boiler output **kW** and the flow amount **L** of the primary pump **M1**!
Difference = kW / L x 860 (adjustable between 5°C and 15°C. The standard value is 10°C).
The flow amount is calculated after the formula: **Litre = 860 x kW / Difference**

Calculation example of the dimensioning of the primary pump M1:
Boiler actual power output = 30kW
Difference = 10°C **L** = 860 x 30 / 10
The required flow amount is searched **L = 2580** (Discharge flow of the Primary pump **M1**)

Function: The return temperature is regulated by means of return sensor and return valve on the return set value **TR S**. The return temperature set value is due to automatically by the boiler temperature set value **TB S**. minus the adjusted difference.

Example:
TK Set = 80°C
Difference = 10K
Effect: Return set value = 70°C

lambda control
calculates automatically
the new **TR S**et value
at **TK-S**et value changing

2. Gliding loading valve set value by TB set minus difference

Function: **The load of the buffer occurs only if the return valve is opened on 100%,** this equates "**Heating starting-up discharge completed** – **buffer up-side warm**".
Now Lambda control calculates the return set value **TR S**. for the loading valve as a function of **TB S.**
The loading valve set value is calculated as follows:

$$\textbf{TR set} = \text{TK set} - \frac{(\text{TK set} - 70)}{(15 / \text{Difference})}$$

lambda control calculates automatically the new **TR S**et value at **TK-S**et value changing

Return- and loading valve regulation system 5

With the following examples it is supposed that the primary pump **M1** is dimensioned for a difference from **10°C** (Kelvin) with a boiler maximum output of **125% = 37.5 kW**.

Example 1:

TB-Set value	**85°C**
Difference	10°C
Boiler partial load	15kW
Boiler nominal output	30kW
Boiler maximum output	37.5kW

Effect: Return valve set value = 75°C
Loading valve set value = 75°C
The difference is unchanged!

With **TB Set** setting **85°C** the return valve set value equals the Loading valve set value and the **boiler output is not reduced**. Loading output = Boiler output (ca. 37kW) minus warm need
That is only heating starting-up discharge, no intelligent buffer management!
Only recommend with high warm need and sufficient buffer volume.
Comment: If the buffer is loaded (**return 85°C**) it is required for the boiler part load a difference from 4°C, this proves a boiler temperature from **89°C = Readiness!**

Example 2:

TB-Set value	**80°C**
Difference	10°C
Boiler partial load	15kW
Boiler nominal output	30kW
Boiler maximum output	37.5kW

Effect: Return valve set value = 70°C
Loading valve set value = 73.33°C
The difference is reduced to 6.66°C

Because the flow amount is unchanged the boiler temperature will rise over the **TB-Set** value and the controller reduces the boiler output to ca. **25 kW**. After the system heating-up with boiler maximum output the boiler output is reduced. Loading output = Boiler output minus warm need. (Highest efficiencies by reducing exhaust losses). The heating starting-up discharge and the intelligent buffer management will be used! Recommended setting for systems with standard-buffer volume which should be also loaded.
Comment: If the buffer is loaded (return 80°C) it is required for the boiler part load a difference from 4°C, this proves a boiler temperature from 84°C = the whole buffer can be raised for
2 times at 4°C (TB act. > 88°C = Readiness)!
Boiler set values ≤ 80°C prove the lowest readiness times.

Example 3:

TB-Set value	**75°C**
Difference	10°C
Boiler partial load	15kW
Boiler nominal output	30kW
Boiler maximum output	37.5kW

Effect: Return valve set value = 65°C
Loading valve set value = 71.66°C
The difference is reduced to 3.33°C

Because the flow amount is unchanged the boiler temperature will rise over the **TB-Set** value and the controller reduces the boiler output to ca. **12.5kW**. **However, this is not permitted by the boiler parameter for checked partial load, by which the controller holds the boiler output on ca. 15 kW (partial load)**. Loading output = Boiler output minus warm need.
Thereby rises the boiler temperature on **75.66°C**. This means, the required difference from 4°C for 15 kW, result automatically from the boiler output.
Comment: After the system heating-up with boiler maximum output, is the buffer loaded with boiler partial load (Highest efficiencies by reducing exhaust losses).
Heating starting-up discharge and the intelligent buffer management are used!
Recommended for low temperature heating systems or by integrated solar in the buffer.
Miscellaneous:

- Return temperature sensor (Pt100 surface-contacting temperature sensor) instead of an sleeve sensor
- Rest warmth denial to boiler minimum temperature
- Refueling signal after burn-off of the boiler (automatic operating continuation)
- Loading valve position at warm production-OFF to buffer ON
- At an return sensor defect, the return- and loading valve regulation is activated at system 3 and 4 as an emergency program

Enlarged application System 5 with oil-/gas boiler

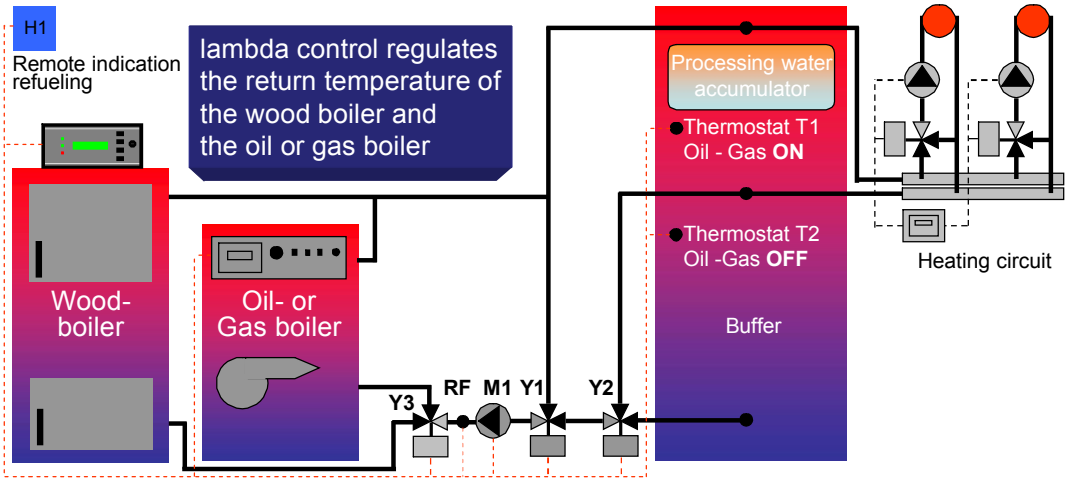
Principle diagram:

System 5: Flow temperature >75°C with 100% of warm required.

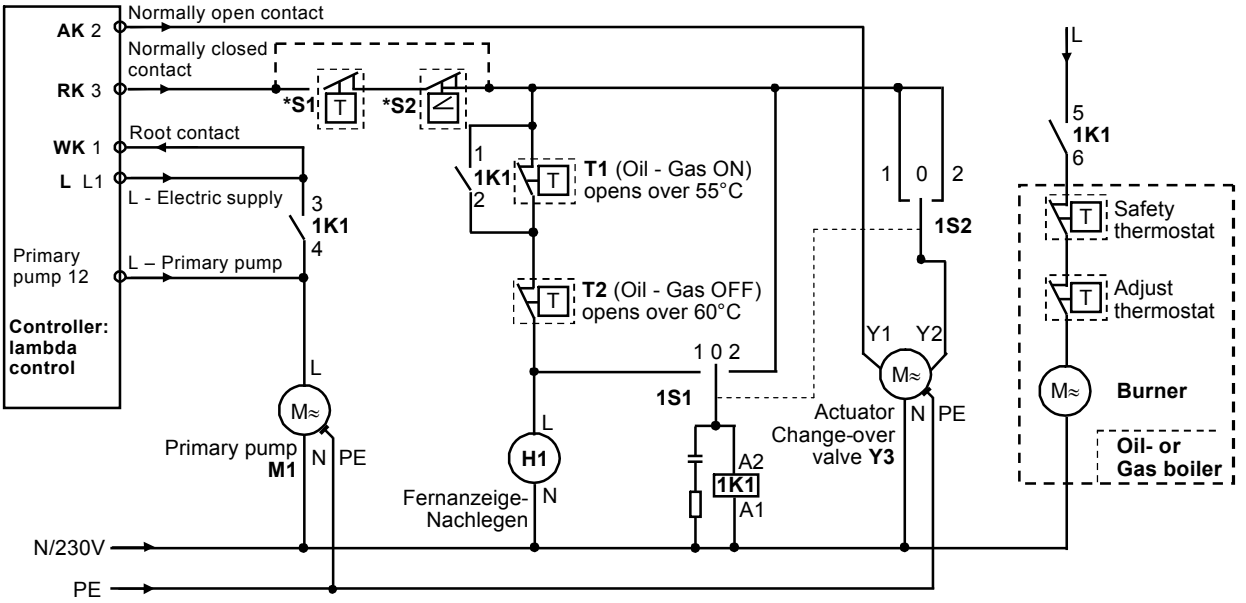
Boiler output: Can be as high as the warm need, by loading valve Y2.
Nevertheless, the buffer is not loaded with 100% of warm need, except with boilers with output reserve or Pk > Qh.

Buffer: See boiler- and buffer dimensioning program.

Processing water production in summer: With wood- or oil-/ gas boiler. A high efficiency is reached by the integrated Processing water accumulator, because no additional radiate- and transmission losses originate.



Wiring diagram: System 5 - two condition



S1 ... Exhaust temperature monitor
S2 ... Door switch
T1 ... Thermostat Oil - Gas ON
T2 ... Thermostat Oil - Gas OFF
1S1 ... Switch 1 - 0 - 2
1 = automatic operating continuation
0 = Oil – Gas boiler OFF
2 = Oil – Gas boiler manual mode
Y3 ... Change-over valve : L at Y1 = Position on wood heating
L at Y2 = Position on Oil – Gas operating

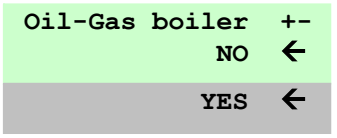
* ... At operation to one chimney must be mounted in the wood boiler a checked exhaust temperature guard (German Institute for Standardization 3440), a switch at the doors and be integrated into the control chain of the oil-/ gas boiler.

Enlarged application System 5 with oil-/gas boiler

Function: After burn-out of the wood boiler, **regulates lambda control the return temperature of the oil-/gas boiler** by means of return sensor and return valve Y1. The return is switched by means of change-over contact (C/O contact) and the 3-way valve Y3 between wood boiler and the oil-/gas boiler. Two thermostats in the buffer **switch ON or OFF the oil-/gas boiler and the primary pump M1.** A maximum life span is reached by the return high posture of the oil-/gas boiler. A pollutant reduction by burner runtime lengthening is likewise reached.

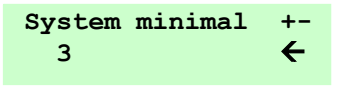
Release of the enlarged system application 5 with oil-/gas boiler in the basic level
(The enlarged application is basically blocked by ***Logotherm***!)
- With ← menu **CHOICE** appeal
- With **+-** **Settings** choose and with ← confirm
- Service code call with **+**
- 2-times input code **+2** (basic level)

1. TEXT



With **+-** **YES** choose and with ← confirm
[Now the application is released in the expert's menu]

2. TEXT



With **+-** **System minimal limitation** choose and with ← confirm
[e.g. **3** unblock in the expert's menu System **3 to 5**]
[e.g. **1** unblock in the expert's menu System **1 to 5**]
If no change is wished, with ← confirm
After the confirmation the regulator returns in the operating program

REMARKS to 1 and 2:

1. Boiler manufacturers which these applications do not need must not change by the basic barrier their documentation (lambda control requests for no enlarged input in the expert's menu). The application can be released any time boiler manufacturer covered by ***Logotherm***, the release is thereby unnecessary in the basic level.

2. Kettle manufacturers the only **system 3 to 5 has released** can thereby release in the special case also the **system application 1 and 2**.

Enlarged application System 5 with oil-/gas boiler

Inputs in the expert's menu if the application in the basic level (code +2) is released

- With ← menu **CHOICE** appeal
- With +- **Settings** choose and with ← confirm
- Service code call with **+**
- Input code **+1 (Technician)**

After the loading valve-setting the additional input occurs

1. TEXT

```
Oil-Gas boiler  +-
             NO  ←
```

With +- YES choose and with ← confirm
If **NO** is selected, the expert's menu is finished and the opposed parameters are stored.
The enlarged application is **not activated.**

2. TEXT

```
Return temp.    +-
Oil-Gas [°C]    ←
```

With +- Return temperature set value for Oil-Gas adjust
and with ← confirm (Setting range 30°C to 80°C)
After confirm with ← the expert's menu is finished and the opposed parameters are stored.
Now the enlarged application is activated.

Functional difference by mono- or bivalent arrangement

1.1 Rest warmth use without oil-/gas boiler (Monovalent):
a, lambda control uses the rest warmth immediately after switch over in warm production OFF
b, lambda control uses the rest warmth by a dynamic cycle up to 6 hours
c, lambda control uses the rest warmth statically if the boiler temperature rises on 90°C

1.2 Rest warmth use with oil-/gas boiler (Bivalent):
a, lambda control uses the rest warmth immediately after switch over in warm production OFF
c, lambda control uses the rest warmth statically if the boiler temperature rises on 90°C
b, Dynamic use is not carried out because of too frequent burner interruption

Functional description of the rest warmth use after boiler burnout

a, lambda control uses the rest warmth immediately after switch over in warm production OFF.
If the boiler temperature is higher than **TBmin** and the difference – boiler flow to boiler return – is higher **5°C**, the rest warmth is delivered to the buffer- and heating system.
If the difference is smaller than **4°C** or the boiler temperature smaller than **TBmin**, the rest warmth use is broken off (primary pump **OFF** - return valve **CLOSED**). The boiler minimum temperature **TBmin** is adjustable in the expert's menu.
b, lambda control uses the rest warmth in the boiler by a dynamic cycle up to 6 hours.
If the boiler temperature is higher than **TBmin** and is the time after switch over in warm production **OFF** smaller than **6** hours, the difference is checked in a 30-minute cycle and if necessary the rest warmth is delivered to the buffer- and heating system.
c, lambda control uses the rest warmth in the boiler statically if the boiler temperature rises on **90°C**.
If the boiler temperature rises on **90°C** from unknown cause, a rest warmth denial is initiated likewise by **TBmin**- or difference under-usage is broken off.

Refueling signal and automatic operating continuation

- The refueling signal occurs at the lambda control by means of a green LED.
- By the potential-free change-over contact a remote indication is possible.
- The change-over can be also used to the release of an oil-/gas boiler.
- The loading valve is put in warm production OFF at buffer ON.
- With an **activated rest warmth use** and release of the bivalent application **the refueling signal and the oil-/gas boiler is switched off**.

System 5 / technician menu Code +1

Lambda control at warm production OFF

- With ← menu **CHOICE** appeal
- With +- **Settings** choose and with ← confirm
- Service code call with **+**
- Input code **+1 (Technician)**

MENU CHOICE

```
CHOICE          +-
INFORMATION     ←
SETTINGS        ←
AGGREGATE TEST  ←
END             ←
```

With +- **Settings** choose and with ← confirm

After input Code +1

```
Language        +-
[D]             ←
[F]             ←
[I]             ←
```

With +- **Language** choose and with ← confirm

```
Boiler type     +-
xxxxxxxxxx      ←
```

With +- **Boiler type** choose and with ← confirm

```
System          +-
No.: 5          ←
```

With +- **System 5** choose and with ← confirm
According to boiler manufacturer the systems 1 to 5 or 3 to 5 are free

```
Are you sure
NO -        YES ←
```

This allows the repetition of the system setting

From difference the expert's menu can be also called in **warm production ON**

```
Difference      +-
TK-TR [°C]   10 ←
```

With +- **Difference** choose and with ← confirm
Standard value 10°C / Setting range 5°C to 15°C

```
Boiler min.     +-
TKmin [°C]   10 ←
```

With +- **Boiler minimal temperature** choose and with ← confirm
Standard value 60°C / Setting range 30°C to 80°C

```
Exhaust min.    +-
Tflmin [°C]  100 ←
```

With +- **Exhaust temperature minimal** choose and with ← confirm
Standard value 100°C / Setting range 90°C to 160°C

```
Return valve    +-
[sec]       150 ←
```

With +- **Return valve runtime** choose and with ← confirm
Standard value 150sec / Setting range 120sec to 240sec

```
Loading valve   +-
[sec]       150 ←
```

With +- **Loading valve runtime** choose and with ← confirm
Standard value 150sec / Setting range 120sec to 240sec

```
Oil-Gas boiler  +-
             NO ←
            YES ←
```

With +- **YES** or **NO** choose and with ← confirm
Standard value NO

```
Return temp.    +-
Oil-Gas [°C] 60 ←
```

With +- **Return temperature** choose and with ← confirm
Standard value 60°C / Setting range 30°C to 80°C
After the confirmation with ←, the opposed values (parameter) are stored and the expert's menu is finished automatically.

Output regulation summary

Output regulation

- The divergence of the boiler temperature- actual value to the kettle temperature-set value becomes, taking into account of the minimum and maximum exhaust temperature, moved in a combustion air amount. This allows holding the boiler temperature and thereby the outputs in the released exhaust temperature area consistently.

System application 3 and 4, if:

- **Heating flow temperature <75°C is required with 100% of warm need**
- Boiler output corresponds to the warm need (frequent system heating)
- small buffer volume is installed
- Loading valve is used (starting-up discharge)
- Solar installation is integrated in the buffer (only System 3)

System application 5 (Steady temperature charging), if:

- **Heating flow temperature > 75°C is required with 100% of warm need**
- Big buffer volumes are used (buffer needs more than one boiler filling to be loaded)
- No loading valve is used (buffer load with maximum output), with loading valve steady temperature load is preserved, loading output by **TB S**.
- High custom waters or heating flow temperature are required (air heater etc...)
- Stratified tank are used
- Boiler exchange by existing buffer systems occurs with steady temperature load was pursued

Advantages of the loading valve with system 3 to 5 (PATENT *Logotherm*)

- Heating starting-up discharge
- Dimensioning of the boiler output according to warm need calculation
- Small buffer (CEN 303) with partial load to capable boiler
- Optimally with solar application ‘cause the buffer base part is mostly cold (at TB set <= 75°C)
- Automatic adaptation of the loading output with rest warmth in the buffer
- Freely eligible supercharging rate or loading output

Advantages of the engine-steered return valve with system 1 to 5

- Return high posture - boiler protection
- Prevention of the chopping of the heat extraction with cold heating system
- Prevention of the gravitation circulation to burnout with loaded buffer
- Rest warmth use also at boiler temperatures smaller 60°C

O_2 sensor

1. O2- regulation

The divergence of the oxygen actual value to the oxygen set value is put down in a secondary combustion air flaps-opening. While refueling or with very dry fuel it can be that at short notice the **secondary air amount in spite of 100% of open air flap** is not sufficient. If more output is required in this situation by the output regulation (gas amount by opening the primary air flap raise), **this would lead to an oxygen starvation and to raised issues.**
Automatic controller measure: The control program recognizes this situation and switches the control strategy to O_2 limitation. Now the **primary** air amount is so steered that an O_2-actual value is reached which is **nearly 1% deeper than the O_2-set value.**
At the definition of the O_2-set values by the kettle manufacturer this must be taken into consideration. The combustion values must be still correct with O_2-set minus 1%.
Fuel dependent changing amount of air: To hold the boiler temperature steady by constant output decrease, the whole combustion air amount must be held steady. The controller solves this task by the fact that a narrow information exchange occurs in the control program between single control segments.

2. Function monitoring in the heating operation

The oxygen sensor is monitored in warm production ON by **permanent functional control**. Should an error be ascertained, the secondary air control occurs after 5 minutes after the Tfl-control program. If the error still exists after 30 minutes, the Tfl-control program and the fault is fixed. In the Tfl-control program the secondary air amount is steered after empiric inquiry.
The fault can be read in warm production OFF.
The fault **"O2 measurm. error"** can be reset only after realization of the aggregate test **"Test probe O2"** and result **"probe okay"** automatically.

3. Automatic calibration and functional test

The calibration **automatically** occurs if the operating hours of the O2 probe are ≥200h and 48h was not heated. After a calibration the operating hours counter of the O2 probe is put on 0 by which automatically after reach from ≥200h a new calibration occurs.
With the calibration the probe is tested for functional efficiency and fatigue symptoms (functional test).
Should a **fault be ascertained**, this is signalled by the **red error lamp**.
The controller uses the Tfl-control program as an emergency program.

4. Manual calibration and functional test

The manual calibration occurs in the aggregate test with the first point **"Test probe O2"**.
After pressure of the button **"+"** the calibration and the functional test are activated.
Condition for the test is a boiler without fire and rest glow

- Controller in "Heat generation OFF"
- In the menu SELECTION **"AGGREGATE TEST"** select and confirm
- With the button **"+"** activate the test

In the text display the O2 value and a countdown counter is indicated, the fan is switched to speed 1 and the secondary flap is opened. Test duration 8 to 12 minutes.
After testing the controller decides "Probe okay" or "Probe defective"

If it's heated daily (also in summer), a manual calibration is necessary once a year!
Should a new probe be inserted or be renewed the regulator, a calibration is likewise necessary.
Delivery state: Controller is calibrated on NEW PROBE!

5. Shut-off criteria (Heat generation OFF)

5.1 Switch off by exhaust temperature too small in the first operating hour of a burn-off

[Tfl- actual value < Tfl- set value x 0.33] more than 15 minutes = Heat generation OFF

5.2 Switch off by O2 after the first operating hour of a burn-off

According to boiler type the controller switches off with **"cross of a least oxygen value longer than 15 minutes"** in heat generation OFF.

This function reduces the foreign power demand and the burn-out losses about 30 to 45 minutes. With the burn-out of the boiler, the combustion air is strongly heated up by glow and hot furnace chamber. This proves a high exhaust temperature and low CO2 = bad cooling in the heat exchanger.

6. Life span of the oxygen probe

- The probe is sensitive by acids and heavy metal connections
  e.g.: Sulphuric acid, lead, cadmium (do not contain in the fuel WOOD).
- A soiling is excluded by the special installation (not in the main exhaust masses stream) of the probe to a great extent.
- If the boiler is not used longer time, the O2 probe all 7 days is heated to hold it dry.
- The manufacturer brags a life span from >10,000 hours.

7. Possible causes by faults

7.1 Oxygen measuring values wrong

- Plastic disc gets dirty
  [Resistor probe body - boiler > 100k Ohm, during measuring disconnect the probe from the controller]
- Probe case has electric connection with boiler body or the boiler jacket
- Controller or probe was renewed without calibrating of the controller

7.2 Oxygen measuring values are deceived by leak air

- Doors or cleaning openings leaking
- Probe screw connection laxly

8. Marking of the connection wires

O_2 sensor summary

Advantages of the oxygen probe

- Less wear by controlled flame temperature
- Optimized combustion also with different fuel and moisture
- Fuel saving by constantly highest possible efficiency
- Environment protection by the lowest issues during the whole burn-out period
- Improved burn-on phase - boiler reaches faster full output
- Improved burn-off phase - disconnection by O2 measurement
- The lowest issues also in modulating operating

1. O2-Regulation

The divergence of the oxygen actual value to the oxygen set value is put down in a secondary combustion air flaps-opening.

2. Functional supervision in the heating operation

The oxygen probe is controlled in warm production ON by permanent functional control. Should an error be ascertained, the secondary air control occurs after 5 minutes by means of the Tfl-control program.

3. Automatic calibration and functional test

The calibration automatically occurs if the operating hours of the O2 probe are ≥200h and 48h was not heated.

4. Manual calibration and functional test

The manual calibration occurs in the aggregate test with the first point **"Test probe O2"**. After pressure of the button **"+"** the calibration and the functional test are activated. Condition for the test is a boiler without fire and rest glow.
If it's heated daily (also in summer), a manual calibration is necessary once a year! Should a new probe be inserted or be renewed the regulator, a calibration is likewise necessary.
Delivery state: Controller is calibrated on NEW PROBE!

5.2 Switch off by O2 after the first operating hour of a burn-off

This function reduces the foreign power demand and the burn-out losses.

6. Life span of the oxygen probe

- The probe is sensitive by acids and heavy metal connections
  e.g.: Sulphuric acid, lead, cadmium (do not contain in the fuel WOOD).
- A soiling is excluded by the special installation (not in the main exhaust masses stream) of the probe to a great extent.
- If the boiler is not used longer time, the O2 probe all 7 days is heated to hold it dry.
- The manufacturer brags a life span from >10,000 hours.

Chimney-sweep's test: Nominal power/ partial-load/ security test

- Press the button **“Refueling”**
- Heating-up the boiler after user manual
- Put on the fuel according to the information of the manufacturer
- Press button **"Heat generation ON"** if the warm production was not automatically switched on yet
- In the choice menu select the menu point **COMBUSTION TEST** and confirm
- In the menu combustion test select **nominal output, partial load or security test** and confirm

Should the function adding be still activated after the choice of the combustion test (display “Refueling” flashes), it is automatically nullified.

COMBUSTION TEST “nominal output” or “partial load” for Issue check
Regulation on the selected output, independent of the boiler temperature set value **TB S**

Aggregate control at system 1 • Custom water load after standard program • Heating pump is switched on in the summer and winter operation	**Test break off** • Warm production in stand-by • Test length >30 minutes • By pressure of the button “Heat generation OFF” • In the menu combustion test "END" select and confirm in “Heat generation OFF” • By automatic switch-off function
Aggregate control at system 2 • Custom water load after standard program • Heating pump (Compulsive warmth decrease) is switched on	
Aggregate control at system 3 to 5 • Standard program	

COMBUSTION TEST “SECURITY TEST” for check STB and thermal discharge safety device
Regulation on the nominal output, independent of the boiler temperature set value **TB S**

Aggregate control system 1 to 5 • Return valve closed • Primary pump (M1) switched off • System 1 and 2: Heating- and custom water case pump OFF • System 3 to 5: Loading valve no function	**Test break off** • Test length >60 minutes • By pressure of the button “Heat generation OFF” • In the menu combustion test "END" select and confirm • By automatic switch-off function in “Heat generation OFF” • Button “+” was not pressed longer than 30sec • STB released (TB act. ≥100°C +0 / -5%) • Boiler temperature ≥115°C

Door opening-refueling/ auto. start-up/ exhaust temperature too high

DOOR OPENING-REFUELING

After pressure of the button “Refueling”

- LED “Refueling” **flashes**

Text with electromagnetic lock
(with degassing flap)

```
DO NOT OPEN !
Please wait
```

Text with electromechanical lock
(without degassing flap)

```
DO NOT OPEN !
Please wait
```

- Fan runs with speed 2
- Secondary air flap is closed
- Primary air flap is fully opened
- After 15 seconds the release of the locking occurs

```
ATTENTION
OPEN SLOWLY !
```

```
unlock the
door to reload
```

- After 10 seconds the electromagnet is switched off
  (The function can be activated by activity of the button “Refuelling”, once more)

```
ATTENTION
OPEN SLOWLY !
```

Then the controller returns in the working program, the fan remains switched on still for 10 minutes. This is signalled by the flashing LED "Refuelling".

- **Cancel of the function by pressure of the button "Heat generation OFF"**

AUTOMATIC START OF OPERATION

- **If a boiler output of approx. 75% is reached with the heating-on process, the controller automatically switches in "Heat generation ON"**

EXHAUST TEMPERATURE TO HIGH

If the exhaust temperature **rises about 300°C**, by too long keeping open of the Filling- or Heating-up door, the **red LED** flashes. Text in the display:

```
fluegas temp.
to high [°C] ###
```

Should the exhaust temperature reach 350°C, the fan is switched off.
After fall below 300°C, he is switched on again.

The highest exhaust temperature value is stored in the regulator and can be brought in the menu "Information" to the display.

- **The highest exhaust temperature value is extinguished by entrance in the set program for the expert.**

Service code / Code +1

CODE +1 = EXPERT'S LEVEL

- In **"Heat generation OFF"** and in **"Heat generation ON"** accessible. In "Heat generation ON" the parameters "Language", "Boiler type", "System" cannot be set.
- It is stayed in the respective set steps longer than 60 seconds, the controller shifts back into the working program, opposed values are not stored.
- The last disturbance and the highest exhaust temperature value are automatically extinguished by entrance in the expert's level.
- The appropriate parameters and functions are automatically given dependent on system.

Language Standard value: German
[D] = German / [F] = French / [I] = Italian
Choice of the desired language for the text display

System Standard value: 1 to 5
Choice of the desired system application (see installation instructions)

Acc. sensor NO = 0 / YES = 1 Standard value: YES
Choice whether an accumulator sensor exists
Sensor type Pt100: At 0°C: R = 100 Ohm / at 100°C: R = 138 Ohm

Acc. sensor length in m [m] Standard value: 8
Setting of the actual cable length of the accumulator sensor

- By **lengthening**, a cable with a **cross section of 2 x 0.75 mm²** is to be used

Buffer max. (Tacmax.) [°C] Standard value: 60
Only at system 1 and 2 (Custom water tank)
Setting of the maximum custom water temperature

Buffer min. (Tacmin.) [°C] Standard value: 45
System 1: Setting of the least custom water temperature (custom water precedence).
At summer operation the refuelling signal occurs with under-usage of the buffer minimum temperature
System 2: Setting of the least custom water temperature (custom water precedence)
System 3: With under-usage of the buffer minimum temperature the refuelling signal and the release of an oil-/gas burner occurs
System 4: With under-usage of the buffer minimum temperature there occurs the refuelling signal, the buffer disconnection (loading valve = 0%) and the release of an oil-/gas burner

Boiler min. (TBmin) [°C] Standard value: 60
System 1 – winter operation: With under-usage of the boiler minimum temperature the refuelling signal and the ending of the rest warmth denial occurs
System 1 - summer operation: No function
System 2: With under-usage of the boiler minimum temperature the refuelling signal and the ending of the rest warmth denial occurs
System 3 to 5: With under-usage of the boiler minimum temperature the ending of the rest warmth denial occurs

Exhaust min. (Tflmin) [°C] Standard value: 100
Choice of the least exhaust temperature required for the chimney

- If the value is higher put, must be calculated with system 1 and 2 with **raised readiness time**. **With system 3 to 5 the buffer size must be considered (boiler output becomes higher at partial load according to setting)**

Return valve Runtime [sec] Standard value: 150
Setting of the runtime of the actuator (Use actuators with 120 to 240 seconds)

Load valve Runtime [sec] Standard value: 150
Setting of the runtime of the actuator (Use actuators with 120 to 240 seconds)

Difference TB-TR [°C] Standard value: 10
Only at system 5
Choice of the temperature difference between boiler flow- and boiler return temperature.
- Dimensioning of the primary pump M1 with boiler nominal output (Pn) = 10°C to 15°C (Kelvin)

Return set value TR-S Oil-/Gas boiler [°C] Standard value: 60
Only at system 5
Choice of the return set value of the oil-/gas boiler by bivalent systems.
WARNING: Dimensioning of the primary pump M1 is laid out on solid fuel operation (see above), therefore should be the boiler output of the oil-/gas boiler not higher than those of the solid fuel boiler. Furthermore the thermostat must be put for switching off the oil kettle or gas kettle, at least about the difference (TB-TR solid fuel boiler) multiplied by 1.2 + return set value (TR-S oil-/gas boiler) higher, so that the burner can deliver his output.

CODE -1 = ENLARGED MENU OF INFORMATION
It allows looking present controller data and functions
- Can be reached in “Heat generation OFF” and in “Heat generation ON”
  Furthermore this option is automatically released if an entrance occurs in the manufacturer's level
- The option is cleared if it's changed from heat generation ON in heat generation OFF
- The appropriate regulator data and functions are automatically given dependent on system

`Tfl set [°C]###.#`	`[Exhaust temperature set value]`
`Tfl act.[°C]###.#`	`[Exhaust temperature actual value]`
`p-motor[%] ###.#`	`[air flap primary]`
`s-motor[%] ###.#`	`[air flap secondary]`
`primary pump +-`	`[Primary pump + ON / - OFF]`
`by-pass valve [%] ###.#`	`[Return valve position] [System 1 to 5]`
`loading valve [%] ###.#`	`[Loading valve position] [System 3 to 5]`
`heat.circ.pump+-`	`[Heating circuit pump + ON / - OFF] [System 1 and 2]`
`DHW pump +-`	`[Domestic hot water pump + ON / - OFF] [System 1 and 2]`
`change-over c.+-`	`[Change-over contact + Refuelling ON / Burner OFF] [Change-over contact - Refuelling OFF / Burner OFF]`
`fan speed # +-`	`[Exhaust fan 0 = OFF / 1 = Speed 1 / 2= Speed 2]`
`type boiler system #`	`[adjusted boiler type] [adjusted system]`
`lambda control Vx.x ########`	`[Controller name] [Software number / Controller number]`

Protective functions / aggregate test

PROTECTION FUNCTIONS: for boiler and aggregates
Automatic functional expiry, once per week if the boiler is not used

- Boiler and probe drying once per week bends forward corrosion damages (fan and actuators ON).
- According to system, pumps and valves are operated to avoid sticking.

Aggregate control at system 1 and 2

Functions with 10-second duration	Functions with 120-second duration
Heating pump and Primary pump ON	Primary- and Secondary air flap opens
Systems with process water tank Process water loading pump ON	Exhaust fan - speed 1 Return valve opens Oxygen probe heater ON

Aggregate control at system 3 and 4

Functions with 10-second duration	Functions with 120-second duration
Primary pump ON	Primary- and Secondary air flap opens
	Exhaust fan - speed 1 Return valve opens **Loading valve opens** Oxygen probe heater ON

Aggregate control at system 5

Functions with 10-second duration	Functions with 120-second duration
Primary pump ON	Primary- and Secondary air flap opens
	Exhaust fan - speed 1 Return valve opens **Loading valve closes** Oxygen probe heater ON

At the end of the protection functions the controller returns in the working program.
During the protection functions the buttons are locked.

AGGREGATE TEST: Assistance by introduction and servicing

- Only in “Heat generation OFF” possible.
- For safety reasons only carry out if no fuel is in the boiler.
- If the test takes longer than 15 minutes, the controller shifts back into the working program.
- The functions are automatically given system- and boiler type’s addicted.

Oxygen probe	Calibration and functional test
Primary pump	ON / OFF
Return valve	OPEN / CLOSE
Exhaust fan	Speed according to Type OFF / Speed1 / Speed2
Door opener	ON / OFF
Air control unit primary	CLOSE (2V) / OPEN (10V)
Air control unit secondary	CLOSE (2V) / OPEN (10V)
System addicted: Loading valve / Domestic hot water load pump / Heating pump	
Change-over contact: Remote indication / Operation continuation	
Illumination and LED at the controller	

FLASHLIGHT SIGNAL: It indicates the switch state of the aggregate.
Flashlight signal **“+”** Aggregate **ON** / Flashlight signal **”-“** Aggregate **OFF**

Security functions / controller test/ PATENT

Function (Problem)	Removal by measure
Power outage with filled boiler	1. The controller continues the operation after return of the mains voltage 2. Secondary air flap is opened - chimney rinse
Controller starts after readiness (stand-by)	Secondary air flap is opened - chimney rinse
Controller at “Heat generation OFF”	Secondary air flap 25% until Tfl <20% from TARmax
“Heat generation OFF”- Boiler temperature measurement error	Secondary air flap 25% until Tfl <100°C All relays are switched off – Return valve 100%
“Heat generation OFF”- Exhaust temperature measurement error	Secondary air flap 25%
“Heat generation OFF”-Button “Refuelling” pressed	TAR >25% from TARmax - Secondary air flap 25%
“Heat generation ON”- Controller detect O2- measurement error	1. After 5min: Secondary air flap works by Tfl-control program 2. After 20min: Test method is initiated 3. After 30min: Alternate program Tfl-control program is fixed
“Heat generation ON”: Secondary deficient air by adding of to small or to dry fuel	1. O_2 actual value <1% - Primary flap is reduced every minute about the factor 0.5 2. Primary regulation regulate the O_2 actual value to the O_2 set value minus 1%
Measuring signal- and function monitoring of the oxygen probe	Periodical, automatic calibration and function test
Data loss	All relays are switched off – Return valve 100%
CPU-ERROR (Crystal break, etc.)	All relays are switched off
Buffer sensor measurement error (Rest warmth denial at system 3 and 4)	Alternate program TB actual value >85°C Primary pump ON / Return valve 100% / Loading valve 100%
Return temperature measurement error (System 5)	Alternate program valves works by system 3 and 4
STB triggered and TB act. >85°C	Primary pump ON / Return valve 100% / Loading valve 100%
Readiness (stand-by) and TB act. >90°C	Fan OFF / Primary- and secondary flap 0%
“Heat generation OFF” and TB act. ≤5°C (frost protection)	Primary pump ON - Return valve 100%
Exhaust temperature > 350°C	Fan OFF / Tfl < 300°C Fan ON
Short-circuit of the button “Heat generation ON”	Controller evaluates the button no more after one-time action
Short-circuit of the button “Refuelling”	Controller evaluates the button no more after one-time action
Entry function (Menu)	After a security time these will leave automatically
Combustion test “nominal output” or “partial load”	Restricted by time and boiler temperature
Combustion test “Security test”	Restricted by time, boiler temperature and the button “+”
Door open - Refuelling	Electromagnetic locking and degassing function
Setting limitation from TB-set and parameter	Area limitation on safe values
Operating without setting by expert	The controller takes up operating only after entire setting of the expert's level
Data storage	Only with sufficient net care (>160V)

Inspection	Institute	Protocol No.
Electrical security VDE 0700-1,EN 60335 VDE 0722	TÜV / Munich	LP0365
Heating- and temperature controller DIN 3440 **Safety temperature limiter** DIN 3440	TÜV / Munich TÜV / Rhineland Producer: JUMO	Model No. FR/TR106595 DIN-Reg.-No. STB82694
Radio protection EN 50081 **Fault-free operation** EN 50082-1 **EG- certificate of conformity**	TÜV / Munich TÜV / Munich TÜV / Munich	E9660-3-01FA E9660-1-00FA E9660-2-1FA E9660-2-00FA E8 95 08 22283 001

[A] PATENT No.: 384 481
[D] PATENT No.: 36 24 864
[CH] PATENT No.: 670 497

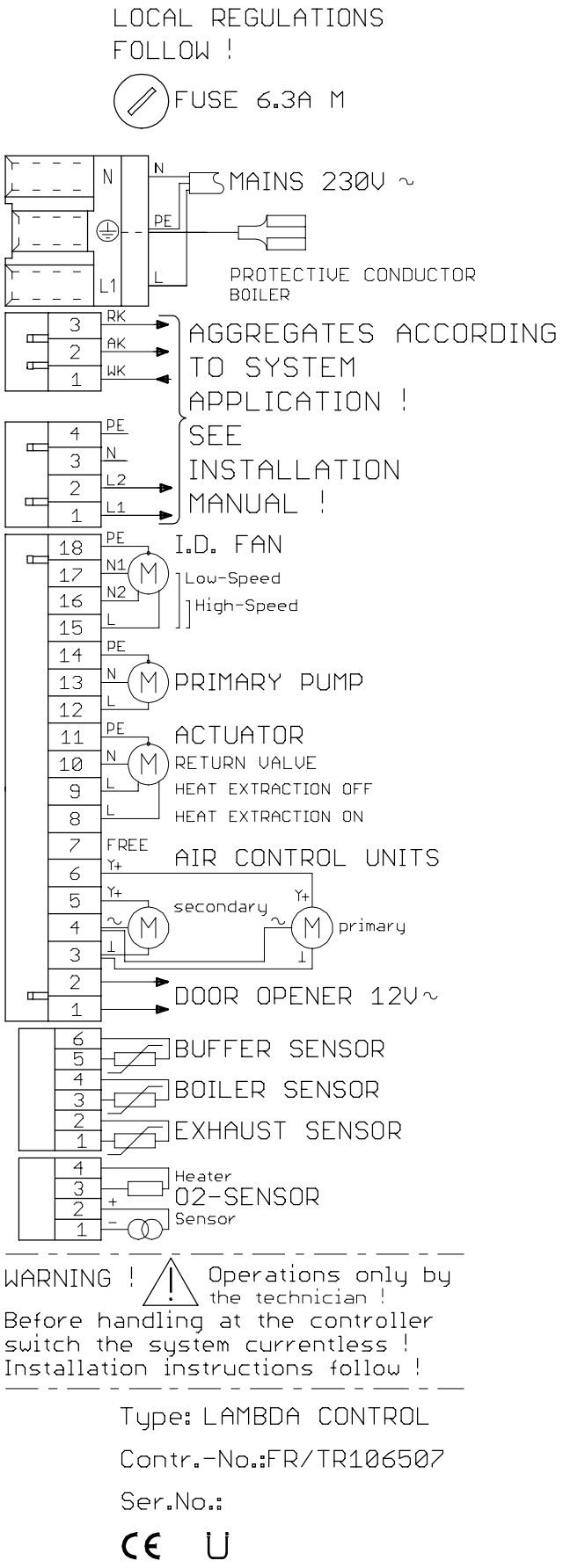
***Logotherm* is a registered trademark No.: 118 033**

Technical data / settings

Mains supply	230V +10 / -15% / 50Hz
Power input	at 230V / max. 30VA
Maximum current draw of the system	Imax = 6.3 A
Fuse plug	5 x 20mm / 6.3 A quick acting fuse
Shutdown temperature of the safety temperature limiter	T = 100°C +0 / -5%
Heating circuit pump (system 1 and 2)	Switching output: 230V / max. 1.5 A
Process water load pump (system 1 and 2)	Switching output: 230V / max. 1.5 A
Actuator for load valve	Switching output: 230V / max. 0.1 A Runtime: 120 to 240 seconds
Actuator for return valve	Switching output: 230V / max. 0.1 A Runtime: 120 to 240 seconds
I.D. fan (induced draught fan)	Switching output: 230V / max. 1.5 A
Primary pump	Switching output: 230V / max. 1.5 A Dimensioning at Pn: 10°C to 15°C
Potential-free change-over contact	Contact rating: 230V / max. 5 A
Regulation output for air regulation units	2 to 10 V= / max. 3 mA
Feed-in output for air regulation units	Output signal voltage: 24 V / 6 VA
Electromagnetic door opener	Output signal voltage: 12 V / 16 VA
Feed-in output for O_2 probe	Output signal voltage: 12 V / 16 VA
Measuring input for Pt100 (0°C = 100Ω / 20°C = 108Ω) Boiler sensor Buffer sensor Return sensor Exhaust sensor	Maximum sensor temperature: Tmax = 150°C Tmax = 150°C Tmax = 150°C Tmax = 600°C
Thermo well for boiler sensor and safety temperature limiter	LW15 with connection spring and clamp Ms63, PN16, length 100mm
Protection class	IP 40 (Controller demounted IP 00)
Operation ambient temperature Storage ambient temperature	0°C to +50°C -20°C to +70°C

Setting - Function	**Value minimal**	**Value maximal**
Boiler set value [TB S]	70°C	85°C
Language [DE] / [GB] / [FR] / [IT] / [DK]		
Type of boiler: According to manufacturer max. 108 Types		
System: According to manufacturer	1	5
Difference TB - TR (System 5)	5°C	15°C
Return set value oil-/gas boiler (System 5)	30°C	80°C
Buffer sensor	No	Yes
Buffer sensor cable length (2 x 0.75mm²)	1 m	50 m
Buffer max. [Tacmax] (System 1 und 2)	55°C	90°C
Buffer min. [Tacmin] (System 1 und 2) Buffer min. [Tacmin] (System 3 und 4)	30°C 30°C	55°C 85°C
Boiler min. [Tmin boiler]	30°C	80°C
Exhaust min. [Tmin fluegas]	90°C	160°C
Return valve runtime	120 seconds	240 seconds
Loading valve runtime	120 seconds	240 seconds

Technical data / connection plan



System 5:
Return sensor instead of buffer

Advantages with lambda control

- **Multifunctional controller for different system applications**
- **Integrated return high posture**
- **Integrated buffer loading regulation**

ADVANTAGES OF THE COMBUSTION AIR REGULATION BY MEANS OF OXYGEN PROBE

- Less wear by controlled flame temperature
- Always optimum combustion also with varying fuel and moisture
- Fuel saving by constantly highest possible efficiency
- Environment protection by the lowest issues during the whole burn-off period
- Improved burn-on phase - boiler reaches faster full achievement
- Improved burn-out phase - switch off by O_2 measurement
- The lowest issues also in the modulating operating

ADVANTAGES BY INFINITELY VARIABLE POWER MODULATION

- Automatic adaptation to the warm need proves always highest possible efficiency and long burning-hour (refuelling intervals)
- According to warm need of the heating and the buffer an automatic adaptation of the boiler output occurs
- By use of the loading valve and by suitable setting of the boiler temperature set value (≤75°C), can be shown consideration for small buffer (load balance memory) and solar integration.

ADVANTAGES BY INTEGRATED LOAD BALANCE REGULATION (PATENT *Logotherm*)

- Small buffer - load occurs only with boiler minimum output minus the warm need
- Output is available on heating up quickly - starting-up discharge
- Low buffer memory losses - volume lower
- Optimum combination with solar systems - buffer below mostly coldly
- Boiler rest warmth use after burn-out up to adjustable boiler minimum temperature

ADVANTAGES BY INTEGRATED PROTECTION FUNCTIONS

- Text display “flue gas temp. to high”, if TAG > 300°C
  Fan “OFF”, if TAG > 350°C - Fan “ON”, if TAG < 300°C
- Exhaust temperature highest value is stored and can be indicated
- Boiler and O2 probe drying once per week bends forward corrosion damages (fan and actuators ON)
- According to system, pumps and valves are operated to avoid sticking
- Function frost protection if TB actual value ≤5°C (Primary pump ON – Return valve OPEN)

Miscellaneous

- Automatic operation admission at rising exhaust temperature
- Assistance of the chimney-sweep by own test function
- An easy handling by text display
- Service program for introduction and servicing
- Automatically activated alternative programs by any fault
- Display “Refuelling”, at the controller and as a remote indication possible

INTRODUCTION PROTOCOL

HYDRAULICS, SECURITY EQUIPMENT AND CHIMNEY		Comment
Boiler and system de-aerate - system pressure - shut-off open		
Thermal expiry protection connected (primary pressure 2 bar - valve water-proof !)		
Pressure control valve connected at the boiler flow		
Expansion tank ca. 10% of the water volume		
Chimney - exhaust way free - pipe connection leak-proof		
No second fireplace connected		
No electric cables or inflammable parts at the exhaust pipe		

BOILER		Comment
Air control units close mounted and plugs completely connected		
I.D. fan mounted (tightened)		
Oxygen probe mounted and tightened (Screw connection and probe)		
Exhaust sensor mounted (Info to the customers: At cleaning pull out)		
Actuator return valve (loading valve) tightened		
STB-sensor and boiler sensor with connection spring completely in the boiler thermo well put.		
The sensors are protected with the provided clamp against unintentional pulling out.		
Exhaust guide plate inserted in the guidance (according to boiler type)		
Cleansing lid tightened		
Function of the doors correctly (tightness)		
Flaming canal - and cinder door fireclay OK (according to boiler type)		
Nozzle correctly inserted (according to boiler type)		
Cinder preset cup from boiler remotely (according to boiler type)		

ELECTRIC CONNECTION		Comment
Electric installation according to pattern and system checks		
Boiler flow and -return grounded		
Grounding conductor cable with the flat-cable plug in boiler lid stuck on		
Plug at the boiler back and in the controller completely engaged		

INTRODUCTION		Comment
System settings after installation instructions carried out		
Aggregate test carried out		
Boiler after operating instructions test heated		
To the customer explains the functions and handling of the heating system		

Customer		**Expert**	
Name		Name	
Street		Street	
Location		Location	
Tel.		Tel.	
Boiler type		Fax	
System No.		Introduction	Mr./Mrs.
Project No.		Date	

FAULTS

1. Fault report which do not admit a continuation of the operation (LED red)

Fault report	**Trouble-shooting**
high-limit. rel. reset !	 TB act ≥100°C +0 / -5%
CAUSES	Comment: Additional possibilities for a release
load present too low ! pump / valve	Power outage - Warmth cannot be taken away STB unaccounted-for gas - Self-monitoring has responded Change controller **- in no case tide over the STB**
Reset	**STB reset at TB act. ≤85°C**

Fault report	**Trouble-shooting**
fluegas temp. measurement err	 Tfl act ≤-22°C or Tfl act ≥+499°C
CAUSES	Comment:
connector/cable sensor defect contr. defect	Measuring input for Pt100 (0°C = 100Ω / 20°C = 108Ω)
Reset	**After fault repair press "←"**

Fault report	**Trouble-shooting**
temp. boiler measurement err	 TB act ≤-22°C or TB act ≥+152°C
CAUSES	Comment:
connector/cable sensor defect contr. defect	Measuring input for Pt100 (0°C = 100Ω / 20°C = 108Ω) Relays' are switched off – Return valve 100%
Reset	**After fault repair press "←"**

Fault report	**Trouble-shooting**
data lost	Software monitoring
CAUSES	Comment:
contr. defect	Relays' are switched off – Return valve 100% Controller must be repaired by the manufacturer
Reset	**"←" Controller starts, but the failure cannot be repaired**

FAULTS

1.1 Fault report which this continue to the operation, up to fault removal admit (LED red flashes)

Fault report	**Trouble-shooting**
O2 measurement err	 not specified
CAUSES	Comment: Additional possibilities for a release of the fault
probe defective or dirty connector/cable	Short circuit of the feed-in 12V/AC or 24 V/AC - Cut-off the controller for 5 minutes from the mains (transformer is secured thermally). Controller defect
Reset	**Only by aggregate test with the first point "test probe O2 +"**

Fault report	**Trouble-shooting**
acc. temp. measurement err	 Tac act ≤-22°C or Tac act ≥+152°C
CAUSES	Comment: System 1 to 4 and buffer sensor YES
connector/cable sensor defect contr. defect	Measuring input for Pt100 (0°C = 100Ω / 20°C = 108Ω)
Reset	**Automatic back-spacing after fault removal**

Fault report	**Trouble-shooting**
return temp. measurement err	 TACact ≤-22°C or TACact ≥+152°C
CAUSES	Comment: Only at system 5
connector/cable sensor defect contr. defect	Measuring input for Pt100 (0°C = 100Ω / 20°C = 108Ω)
Reset	**Automatic back-spacing after fault removal**

Fault report	**Trouble-shooting**
temp. boiler too low	System 1 to 4: Operating time >45min and TB act <60°C for 30min System 5: Operating time >45min and TR act <TR set -2°C for 30min
CAUSES	Comment:
Y1 - valve connector/cable motor/contr.	A release occurs at the earliest after 75 minutes, after from "heat generation OFF" was switched in "heat generation ON"
Reset	**Press at „heat generation OFF" the button "←"** **Fault text is shown** **Press the button "←" - Fault is deleted**

2. In spite of fuel, the controller switches off after the first operating hour

Cause fuel: To high O2 - no gasification

- Too big and/or too moist [split-up]
- Not homogeneous in the filling space [fill short log, displaced in the filling space]
- Does not slide down - too long
- Operating error at heating-up (see operating manual)

2.1 Boiler no power (output): See also point 2.

- Boiler not cleaned
- Combustion air supply is dirty
- Exhaust way is blocked in the boiler or chimney
- I.D.fan speed 1 or speed 2 defect [Aggregate test]
- Air flap primary or secondary defect [Aggregate test]
- Connectors' at the controller or boiler not completely engaged [Aggregatetest]

- **O_2 measurement error**
- Plastic disc is dirty
  [Resistance Probe body - boiler >100k Ohm by measuring, disconnect the probe of the controller]
- Probe case has electric connection with boiler body or -jacket
- Controller or probe was renewed without calibrating the controller
  A manual calibration occurs through the aggregate test with the menu point "test probe O2 +"
  IMPORTANTLY at calibration, no fire and no rest glow!

- **Oxygen measuring values are deceived by leak air**
- Doors or cleaning openings leaking
- Probe screw connection loosen

3. SYSTEM 3: Buffer is not loaded

- Boiler temperature set value <75°C [set to 80°C – 85°C]
- Flow rate of the primary pump too small [step switch?]
- Loading valve defect [Aggregate test]
- Kettle dimensions too small [Consultation with boiler manufacturer]

4. SYSTEM 3: Oil-/Gas boiler is not enabled

CAUSE: The oil-/gas boiler is switched off by the return temperature of the heating manifold by lambda control
REMEDY: Put **Tacmin** in the expert's menu on **70°C** to **85°C** and/or move the buffer sensor in the middle of the buffer

CAUSE: Electric wiring wrong - Burner is not released
REMEDY: Electric wiring rectify
[Aggregate test – test the function of the change-over contact]

Service code / Code -2 (Par. 14 – 16)

CODE -2 (2-times input) = MANUFACTURER'S LEVEL

Can be reached in “Heat generation OFF” and in “Heat generation ON”.
It is stayed in the respective set steps longer than 60 seconds, the controller shifts back into the working program, opposed values are not stored.
ATTENTION: Changes only after consultation with the boiler manufacturer!

Functional description manufacturer's level
In the manufacturer's level the changes of the boiler parameters which are automatically stored with the abandonment can be carried out.
If another boiler type is selected in the expert's level, the boiler parameters are replaced with those of the new Type.
Becomes the adjusted boiler type by pressure of the buttons (+) or (-) once more selected, the changed parameters are replaced with the original parameters.

Parameter Code -2	Unit	min	max
14: Boiler temperature max. (TBmax)	[°C]	90	110
15: TARmax maximum output	[°C]	30	200
16: TARmin partial load	[°C]	10	180
17: VLmin-primary Opera.-readiness	[%]	0	30
18: VL- split-up Tfl-control	[F]	10	200
19: O2-conrol	[F]	0	1
20: O2-set value at TARmax O_2 x 10	[%]	20	120
21: O2-set value at TARmin O_2 x 10	[%]	20	120
22: Fuel CO2%max CO2 x 10	[%]	50	209
23: Secondary strengthening	[F]	1	255
24: Primary strengthening	[F]	1	255
25: O2-swith-off timer start at >	[%]	0	18
26: Function refuelling	[F]	0	20
27: Speed-2 release	[F]	0	3
28: Door magnet	[F]	0	2

F = Function or Factor

14: Boiler temperature max (TBmax) [°C]: Standard value: 90

- Loading valve open at system 3 and 4 [TBmax -6°C]
- TB-set value adjustable range to [TBmax -5°C]
- Readiness ON [TBmax -2°C]
- Readiness OFF [TBmax -2.5°C]
- Primary and secondary closed at [TB > TBmax]

If the value is higher put must be pay attention to the switch-off temperature of the STB (100°C 0 /-5%) and to the regulations

15: TARmax maximum output [°C]: Standard value: 100 to 170

The value must be chosen so that by soiling of the boiler or with humid fuel the **nominal output** is produced.
Dimensioning suggestion: Pnen x 1.25 = Pmax [TAR = Tfl minus TB]

- Automatic operating admission at ≥75% from TARmax
- TARmax x 0.8 = Set value for the Chimney-sweep's test “nominal output” and “security test”

16: TARmin partial load [°C]: Standard value: 30 to 80

- Set value for the Chimney-sweep's test “partial load”
- Set value by buffer loading with partial load at system 3 to 5

Service code / Code -2 (Par. 17 – 21)

17: VLmin-primary Opera.-readiness [%]: Standard value: 10 to 15

Minimum opening primary in the operation and at [TB act >88 AND TB act <90]

- Value too small: Switch over in speed 1 is prevented
- Value too large: Partial load maybe cannot be reached
- Please note the death way of the variable speed drive on no account to receive a too small least opening!

18: VL-split-up Tfl-control [F]: Standard value: 100

- By development on the same air amounts with hardwood and water content 18% pay attention!

The adjusted value, divided by 100, proves the relation primary air to secondary air.	
Parameter = 50	At VL- primary = 100% is VL- secondary (max) = 50%
Parameter = 100	At VL- primary = 100% is VL- secondary (max) = 100%
Parameter = 150	At VL- secondary = 100% is VL- primary (max) = 66%
Parameter = 200	At VL- secondary = 100% is VL- primary (max) = 50%

19: O2-conrol [F]: Standard value: 1

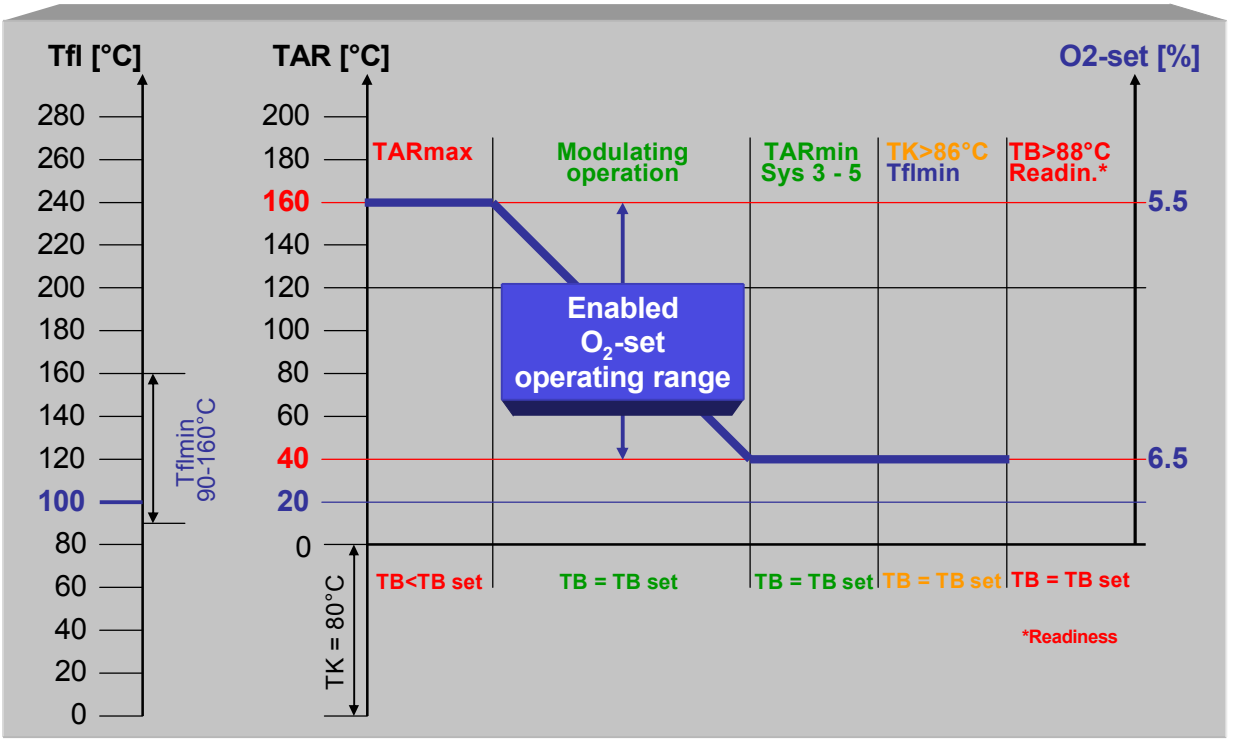
Parameter = 0	Tfl-control (see Parameter 18)
Parameter = 1	O2-control

20: O2-set value at TARmax O_2 x 10 [%]: Standard value: 55

- Input 55 equates 5.5% O_2-set value
- If O_2-set values are put less than 5%, the flame temperature is to be followed (Life span of the furnace chamber etc.!)
  The O_2-set value at TARmax can be smaller or the same, or greater than the O_2set value at TARmin.

21: O2-set value at TARmin O_2 x 10 [%]: Standard value: 65

- Input 65 equates 6.5% O_2-set value
- If O_2-set values are put less than 5%, the flame temperature is to be followed (Life span of the furnace chamber etc.!)
  The O_2-set value at TARmin can be smaller or the same, or greater than the O_2set value at TARmax.



Service code / Code -2 (Par. 22 – 28)

22: Fuel CO2%max CO2 x 10 [%]: Standard value: 203

- Input 203 equates 20.3% CO2 content (WOOD)
- Used for calculation from CO2-set value, CO2-actual value, ETA-F, lambda

23: Secondary strengthening [F]: Standard value: 100

- Adaptation to the controllability of the boiler (Air flap - rock pressure conditions)
  Fan standard value with two speeds is 100
  Fan standard value with one speed it 50

24: Primary strengthening [F]: Standard value: 100

- Adaptation to the controllability of the boiler (Air flap - rock pressure conditions)
  Fan standard value with two speeds is 100
  Fan standard value with one speed it 50

25: O2-swith-off timer start at > [%]: Standard value: 11 to 14%

- If the operating time is >60 minutes and the value (P25) is exceed longer than 15 minutes the controller switches in “Heat generation OFF”.
  Value too small: Perhaps, to early switching off with moistly wood or at burn-out
- If the parameter P25 is put on 0, the controller switches off only about the exhaust temperature.
  If the operation time is <60min **or** the Tfl-control program is activated **or** P25 = 0, **and** 15 minutes [TAR <TAR-set x 0.33] the controller switches in “Heat generation OFF”.
  (TAR-set is automatically given in the control program)

26: Function refuelling [min]: Standard value: 10

The value is based after the filling duration and the automatic operating admission after making of the fire (see P15)

Parameter = 0	Function “Refuelling” is deactivated
Parameter = 10	Function „Refuelling“ is activated for 10 minutes

27: Speed-2 release [F]: Standard value: 1

Parameter = 0	Fan with **one** speed: If an engine with only one speed is required
Parameter = 1	Fan with two speeds = standard: Maximum exploitation of the functions from lambda control Refuelling: Speed 2 Heat generation ON: Both speeds are used according to power demand TB act. < TB set - 2°C = Speed 2 TB act. > TB set + 2°C = Speed 1
Parameter = 2	Fan with **two** speeds: Output is produced with small speed - Door opening with high speed (Speed 2) Refuelling: Speed 2 “Heat generation ON”: Only speed 1 is used
Parameter = 3	Fan with **two** speeds: Chimney shows at times high counter pressure - Output control only with Speed 2 Refuelling: Speed 2 “Heat generation ON”: Only speed 2 is used

28: Door magnet [F]: Standard value: -

Parameter = 0	No electromagnetic locking No text in the display No function of the control outlet
Parameter = 1	Electromagnetic locking Example: Degassing by means of degassing flap
Parameter = 2	Electromagnetic locking Example: Degassing by means of filling door

SYSTEM 1: Monovalent system with custom water tank

(Please, follow the recommendation of the boiler manufacturer for a operating without a buffer)

Function description from lambda control

OPERATION: Summer

- Load of the custom water tank to “Tacmax” by difference regulation
- Compulsive warmth decrease by heating pump
- Rest warmth use by custom water tank (Difference regulation)
- Refuelling signal at under-usage of the custom water-minimum temperature (Tacmin)

After switching on of the heat generation

- Refuelling signal OFF Change-over contact WK-AK (-)
- “TB act.” ≥50°C Primary pump ON “TB act.” ≥55°C Return valve opens proportional
- Return valve >15% and “TACact” < “Tacmax” and “TB act.” > “TACact” + 5°C = Custom water loading pump ON
- After achievement of “Tacmax” the custom water loading pump is switched off.
- “TB act.” ≥87°C = Heating pump ON (Compulsive warmth decrease)

After switching off of the heat generation

- “TACact” < “Tacmax” and “TB act.” > “TACact” + 5°C = Custom water loading pump ON / Return valve 100% / Primary pump ON
- “TB act.” > 90°C = Heating pump ON / Return valve 100% / Primary pump ON
- “TACact” < “Tacmin” = Refuelling signal ON Change-over contact (+)

OPERATION: Winter

- Load of the custom water tank with precedence to “Tacmin” by difference regulation
- Reloading of the custom water tank with “TB act.” > “TB set” + 2°C on “Tacmax”
- Heating-parallel operation by too low warm decrease of the custom water tank
- Rest warmth denial by custom water tank and heating
- Heating release by control of the heating pump
- Limitation of the rest warmth use by boiler minimum temperature
- Refuelling signal at under-usage of the boiler minimum temperature

After switching on of the heat generation

- Refuelling signal OFF Change-over contact WK-AK (-)
- “TB act.” ≥50°C Primary pump ON “TB act.” ≥55°C Return valve opens proportional
- Return valve >15% and “TACact” < “Tacmax” and “TB act.” > “TACact” + 5°C = Custom water loading pump ON (Heating pump ON at too low warm decrease by the custom water tank)
- After achievement of “Tacmin” the custom water loading pump is switched off (precedence finished) and the heating pump is switched on.
- At “TB act.” > “TB set” + 2°C the custom water loading pump is switched on (reloading) and with achievement from Tacmax the custom water loading pump is switched off.

After switching off of the heat generation, if “TB act.” > “TBmin”

- Return valve 100% / Primary pump ON / Heating pump ON
- Refuelling signal OFF Change-over contact WK-AK (-)
- “TACact” < “Tacmax” and “TB act.” > “TACact” + 5°C = Custom water loading pump ON

After switching off of the heat generation, if “TB act.” < “TBmin”

- Return valve 0% / Primary pump OFF / Heating pump OFF / Custom water loading pump OFF
- Refuelling signal ON Change-over contact WK-RK (+)

Monovalent system without custom water tank or buffer sensor defect = no custom water function

Change-over contact:
WK = Root contact of a relay / RK = Normally closed contact of a relay / AK = Normally open contact of a relay
(-) = WK-AK connected / Indicator in the enlarged menu of information flashes on MINUS
(+) = WK-RK connected / Indicator in the enlarged menu of information flashes on PLUS

SYSTEM 2: Bivalent system with custom water tank

(Please, follow the recommendation of the boiler manufacturer for a operating without a buffer)

- Load of the custom water tank to “Tacmax” by difference regulation
- Reloading of the custom water tank with “TB act.” > “TB set” + 2°C on “Tacmax”
- Compulsive warmth decrease by heating pump
- Rest warmth denial by custom water tank and heating
- Limitation of the rest warmth use by boiler minimum temperature
- Refueling signal at under-usage of the boiler minimum temperature

Function description from lambda control

After switching on of the heat generation

- Refuelling signal OFF Change-over contact WK-AK (-)
- “TB act.” ≥50°C Primary pump ON “TB act.” ≥55°C Return valve opens proportional
- Return valve >15% and “TACact” < “Tacmax” and “TB act.” > “TACact” + 5°C = Custom water loading pump ON
- After achievement of “Tacmin” the custom water loading pump is switched off (precedence finished)
- At “TB act.” > “TB set” + 2°C the custom water loading pump is switched on (reloading) and with achievement from Tacmax the custom water loading pump is switched off
- “TB act.” ≥87°C = Heating pump ON (Compulsive warmth decrease)

After switching off of the heat generation, if “TB act.” > “TBmin”

- Return valve 100% / Primary pump ON
- Refuelling signal OFF Change-over contact WK-AK (-)
- “TB act.” > “TBmin” and “TACact” < “Tacmax” and “TB act.” > “TACact” + 5°C = Custom water loading pump ON
- “TB act.” > 90°C = Heating pump ON (Compulsive warmth decrease)

After switching off of the heat generation, if “TB act.” < “TBmin”

- Return valve 0% / Primary pump OFF / Custom water loading pump OFF
- Refuelling signal ON Change-over contact WK-AK (+)

Bivalent system without custom water tank or buffer sensor defect = no custom water function

Change-over contact:
WK = Root contact of a relay / RK = Normally closed contact of a relay / AK = Normally open contact of a relay
(-) = WK-AK connected / Indicator in the enlarged menu of information flashes on MINUS
(+) = WK-RK connected / Indicator in the enlarged menu of information flashes on PLUS
Example: WK connected with RK - corresponds to “oil-/gas burner is released”.

SYSTEM 3: Mono- or bivalent system with buffer and loading valve

- Buffer after **PATENT *Logotherm*** with loading valve
- Intelligent buffer management after **PATENT *Logotherm***
  (Buffer load after boiler output reduction, e.g., load balance memory)
- Heating precedence with buffer or energy storage with loading output dependent on need
  (Loading output automatically conformity by default of the boiler temperature-set value)
- Rest warmth denial to boiler minimum temperature (difference regulation)
- Refueling signal at under-usage of the buffer minimum temperature

Function description from lambda control

After switching on of the heat generation

- Refuelling signal OFF Change-over contact WK-AK (-)
- "TB act." ≥50°C Primary pump ON
- "TB act." ≥55°C Return valve opens proportional
- "TB act." ≤72°C Loading valve closed (Heating precedence)
- "TB act." >72°C Loading valve opens proportional
  (Loading output by "TB set" set point and temperature of the buffer)
- "TB act." ≥84°C Loading valve open

Output regulation

- "TB act." ≤ "TB set" modulating operation to "TARmax" maximum output
- "TB act." > "TB set" and "TB act." < 86°C = "TARmin" partial load operation
- "TB act." > 86°C and "TB act." < 88°C = exhaust temperature minimal
- "TB act." > 88°C = Readiness (stand-by)

After switching off of the heat generation, if "TB act." > "TBmin" and "TB act." > "TACact." + 5°C

- Return valve 100% / Loading valve 100% / Primary pump ON
- Refuelling signal OFF Change-over contact WK-AK (-)

After switching off of the heat generation, if "TB act." < "TBmin"

- Return valve 0% / Loading valve 0% / Primary pump OFF
- "TACact" > "Tacmin" = Refuelling signal OFF Change-over contact WK-AK (-)
- "TACact" < "Tacmin" = Refuelling signal ON Change-over contact WK-RK (+)

"TB act." > 85°C and STB released or "TB act." > 85°C and buffer sensor NO/defect

- Return valve 100% / Loading valve 100% / Primary pump ON
- Refuelling signal OFF Change-over contact WK-AK (-)

"TB act." < 85°C and STB released or "TB act." < 85°C and buffer sensor NO/defect

- Return valve 0% / Loading valve 0% / Primary pump OFF
- Refuelling signal ON Change-over contact WK-RK (+)

Change-over contact:
WK = Root contact of a relay / RK = Normally closed contact of a relay / AK = Normally open contact of a relay
(-) = WK-AK connected / Indicator in the enlarged menu of information flashes on MINUS
(+) = WK-RK connected / Indicator in the enlarged menu of information flashes on PLUS
Example: WK connected with RK - corresponds to "oil-/gas burner is released".

SYSTEM 4: Mono- or bivalent system with buffer and loading valve

- Buffer after **PATENT *Logotherm*** with loading valve
- Buffer with double-pipe connection or in series
- Intelligent buffer management after **PATENT *Logotherm***
  (Buffer load after boiler output reduction, e.g., load balance memory)
- Heating precedence with buffer or energy storage with loading output dependent on need
  (Loading output automatically conformity by default of the boiler temperature-set value)
- Rest warmth denial to boiler minimum temperature (difference regulation)
- Refueling signal at under-usage of the buffer minimum temperature

Function description from lambda control

After switching on of the heat generation

- Refuelling signal OFF — Change-over contact WK-AK (-)
- "TB act." ≥50°C Primary pump ON
- "TB act." ≥55°C Return valve opens proportional
- "TB act." ≤72°C Loading valve closed (Heating precedence)
- "TB act." >72°C Loading valve opens proportional
  (Loading output by "TB set" set point and temperature of the buffer)
- "TB act." ≥84°C Loading valve open

Output regulation

- "TB act." ≤ "TB set" modulating operation to "TARmax" maximum output
- "TB act." > "TB set" and "TB act." < 86°C = TARmin partial load operation
- "TB act." > 86°C and "TB act." < 88°C = exhaust temperature minimal
- "TB act." > 88°C = Readiness (stand-by)

After switching off of the heat generation, if "TB act." > "TBmin" and "TB act." > "TACact." + 5°C

- Return valve 100% / Loading valve 100% / Primary pump ON
- Refuelling signal OFF — Change-over contact WK-AK (-)

After switching off of the heat generation, if "TACact." > "Tacmin"

- Loading valve 100%
- Refuelling signal OFF — Change-over contact WK-AK (-)

After switching off of the heat generation, if "TACact." < "Tacmin"

- Loading valve 0%
- Refuelling signal ON — Change-over contact WK-RK (+)

"TB act." > 85°C and STB released or "TB act." > 85°C and buffer sensor NO/defect

- Return valve 100% / Loading valve 100% / Primary pump ON
- Refuelling signal OFF — Change-over contact WK-AK (-)

"TB act." < 85°C and STB released or "TB act." < 85°C and buffer sensor NO/defect

- Return valve 0% / Loading valve 100% / Primary pump OFF
- Refuelling signal ON — Change-over contact WK-RK (+)

Change-over contact:
WK = Root contact of a relay / RK = Normally closed contact of a relay / AK = Normally open contact of a relay
(-) = WK-AK connected / Indicator in the enlarged menu of information flashes on MINUS
(+) = WK-RK connected / Indicator in the enlarged menu of information flashes on PLUS
Example: WK connected with RK - corresponds to oil-/gas burner is released ".

SYSTEM 5: Mono- or bivalent system with buffer

- Buffer in all connection variations
- Steady temperature load (loading valve optional)
- Regulation of the return valve and the optional loading valve by means of return sensor
- Gliding return- and loading valve set value by “TB set” minus difference
- Rest warmth denial to boiler minimum temperature
- Refueling signal after switching off of the heat generation

Function description from lambda control

After switching on of the heat generation

- Refuelling signal OFF Change-over contact WK-AK (-)
- “TB act.” ≥50°C Primary pump ON and Return valve enabled
- Regulation of the return temperature to “TR set” (“TR set” = “TB set” minus difference)

Additional function by use of the loading valve

- If the return valve is opened on 100% (heating starting-up discharge finished), the loading valve takes over the regulation of the return temperature.
- The return temperature set value (Loading valve set value) is determined by the TB-set value.
- “TB set” = The result of 70% is a load with kettle part load
- “TB set” = The result of 78°C is a load with boiler actual output (Pmax + Pmin) / 2
- “TB set” = The result of 85°C is a load with boiler nominal output (maximal output)

Output regulation

- “TB act.” ≤ “TB set” modulating operation to “TARmax” maximum output
- “TB act.” > “TB set” and “TB act.” < 86°C = “TARmin” partial load operation
- “TB act.” > 86°C and “TB act.” < 88°C = exhaust temperature minimal
- “TB act.” > 88°C = Readiness (stand-by)

After switching off of the heat generation, if “TB act.” > “TBmin”

- Return valve 100% / Loading valve 100% / Primary pump ON
- Refuelling signal ON Change-over contact WK-RK (+)

After switching off of the heat generation, if “TB act.” < “TBmin”

- Return valve 0% / Loading valve 100% / Primary pump OFF
- Monovalent: Refuelling signal ON Change-over contact WK-RK (+)
- Bivalent: Refuelling signal ON Change-over contact WK-RK (+)

“TB act.” > 85°C and STB released or [“TB act.” > 85°C and return sensor defect (only Monovalent)**]**

- Return valve 100% / Loading valve 100% / Primary pump ON
- Monovalent: Refuelling signal OFF Change-over contact WK-RK (+)
- Bivalent: Refuelling signal OFF Change-over contact WK-AK (–)

“TB act.” < 85°C and STB released or [“TB act.” < 85°C and return sensor defect (only Monovalent)**]**

- Return valve 0% / Loading valve 100% / Primary pump OFF
- Monovalent: Refuelling signal OFF Change-over contact WK-RK (+)
- Bivalent: Refuelling signal OFF Change-over contact WK-RK (+)

Bivalent, return sensor defect and “TB act.” > 90°C: Refuelling signal OFF

- Return valve 100% / Loading valve 100% / Primary pump ON / Change-over contact WK-AK (–)

Bivalent, return sensor defect and “TB act.” < 90°C: Refuelling signal ON

- Return valve 100% / Loading valve 100% / Primary pump OFF / Change-over contact WK-RK (+)
  (Oil-/Gas boiler works, but without **return high posture**)

Change-over contact:
WK = Root contact of a relay / RK = Normally closed contact of a relay / AK = Normally open contact of a relay
(-) = WK-AK connected / Indicator in the enlarged menu of information flashes on MINUS
(+) = WK-RK connected / Indicator in the enlarged menu of information flashes on PLUS
Example: WK connected with RK - corresponds to oil-/gas burner is released ".